phaenogams and cryptogams, including the fullest set of William Oakes' plants which were distributed after his death. The Lowell herbarium, given to the Society by John Amory Lowell, numbers about 18000 sheets, among which are the following collections: Mary Wight's Algae and the invaluable Thomas Taylor and C. J. Sprague collections of lichens, as well as some of W. S. Sullivant's mosses. The Lowell herbarium is preserved intact and is still arranged according to the system of Endlicher's Genera Plantarum.

Bowdoin College, Brunswick, Maine. — The herbarium of Bowdoin College, now in charge of Professor L. A. Lee, is inaccessible for reference, being mostly unmounted and without special arrangement. It contains many specimens of plants collected by Rev. Joseph Blake, but the most important portion of the herbarium is probably the plants collected on the early surveys of Maine.

Brace, John Pierce, see Williams College.

NOTES ON A COLLECTION OF CRATAEGUS MADE IN THE PROVINCE OF QUEBEC NEAR MONTREAL.

C. S. Sargent.

The following notes are based on collections made by Mr. J. G. Jack, principally in 1899 and 1900, in the neighborhood of the Lachine Rapids of the St. Lawrence River. The region which has been particularly examined by Mr. Jack is on both banks of the Rapids, and south of the River extends from a point just below them up the River for a distance of fifteen miles and back from the River for about ten miles. The country is here broken into rough rocky limestone ridges, which have been principally cleared of their original forests and are now largely covered with thickets of Thorns, Wild Apples, Plums and Wild Cherries. In addition to the following species, which can be distinguished in Mr. Jack's collections, are probably a number of others in the group of the *Tenuifoliae*. These, however, cannot be satisfactorily characterized until the plants can be more fully studied in the field than has been possible up to this time.

Crus-galli.

Crataegus Crus-galli, Linnaeus, Chateaugay, *J. G. Jack*, August, 1892, May and August, 1899.

Punctatae.

Crataegus punctata, Jacquin, Province of Quebec, *J. G. Jack*, Sept. 1887, St. Helen's Isle, opposite Montreal, August, 1892, Levis, Sept. 1900, Montmorency Falls, August 1895.

Crataegus suborbiculata. Glabrous with the exception of a few short caducous hairs near the base of the upper surface of the pale yellow-green unfolding leaves and below in the axils of their veins. Leaves semiorbicular, particularly on leading shoots, to oval or rarely oblong, short-pointed at the apex, rounded and more or less decurrent at the base on the slender grooved slightly glandular petioles, mostly slightly divided above the middle into three or four pairs of short acute lobes, doubly and sharply glandular-serrate except toward the base, thin and firm in texture, dark dull green above, paler below, about 1½ in. long and broad, or on leading shoots occasionally twice as large, the slender midribs and remote primary veins deeply impressed above; petioles from ⅝ to 1 in. in length; stipules linear-lanceolate, coarsely glandular-serrate, ⅓ to ½ in. long. Flowers ¾ in. in diameter on short stout pedicels in compact compound 6–12-flowered thin-branched cymes; bracts and bractlets linear, finely glandular-serrate, caducous; calyx-tube broadly obconic, the lobes lanceolate, acuminate, entire or occasionally obscurely denticulate, reflexed after anthesis; stamens 20; filaments stout, elongated; anthers small, rose-colored, fading dark purple; styles 5, surrounded at the base by a broad ring of hoary tomentum. Fruit in few-fruited erect clusters on short rigid peduncles, subglobose but often rather longer than broad, ⅝ in. in diameter, dull red, more or less blotched with green and often entirely green on one face; calyx enlarged, persistent, with a broad, deep cavity, the lobes linear-lanceolate, abruptly narrowed from broad bases, dark red on the upper side, nearly entire, wide-spreading and often closely appressed, usually persistent; flesh yellow, thin, dry and hard; nutlets 5, broad and thick, slightly and irregularly grooved on the back, about ¼ in. long.

A tree rarely more than 15 or 16 feet in height with a well developed trunk 6 or 8 in. in diameter covered with pale gray scaly bark, stout wide-spreading branches forming a low flat-topped head, and stout slightly zigzag branchlets marked by small lenticels, lustrous and bright orange-brown for one or two seasons, finally dull ashy gray, and armed with straight slender chestnut-brown lustrous spines from 1 to 2 in. in length.

Flowers during the first week in June. Fruit ripens after the first of October, and falls without becoming mellow.

Low rocky limestone ridges, *J. G. Jack*, Caughnawaga, August 29, 1899, May and September, 1900, Rockfield, May and September, 1900.

Molles.

Crataegus Canadensis. Leaves ovate, short-pointed broadly cuneate, or on leading shoots truncate at the base, slightly lobed usually only above the middle with short broad acute lobes, coarsely and frequently doubly serrate often to the base with spreading glandular teeth; in early spring coated above with soft white hairs and below with dense hoary tomentum; at maturity thin and firm, blue-green, glabrous or scabrate on the upper surface, paler and pubescent on the lower surface particularly along the slender midribs and thin nearly straight primary veins running to the points of the lobes, 2 to 2½ in. long, 1½ to nearly 3 in. wide; petioles slender, often slightly winged above, deeply grooved, conspicuously glandular with stipitate dark glands, tomentose or finally nearly glabrous, from ¾ to 1 in. in length; stipules linear, minutely glandular-serrate, from ½ to ¾ in. long, caducous. Flowers ¾ in. in diameter, in broad loose compound thin-branched tomentose many-flowered cymes; bracts and bractlets linear-lanceolate, glandular-serrate, dark red in fading; calyx-tube broadly obconic, villose with long matted white hairs, the lobes lanceolate, acuminate, glandular with large red stipitate glands, villose on both surfaces, reflexed after anthesis; stamens 20; filaments slender; anthers small, nearly white; styles 5, surrounded at the base by a thin ring of pale tomentum. Fruit in erect thick-stemmed slightly villose clusters, short-oblong to subglobose, crimson, lustrous, marked by large pale lenticels, slightly villose at the ends, from ⅓ to ½ in. long, about ⅓ in. thick; calyx-tube prominent with a broad, deep cavity, the lobes gradually narrowed from their broad bases, glandular, villose, spreading and reflexed, or often deciduous before the ripening of the fruit; flesh yellow, thin, dry and mealy; nutlets 5, thin, irregularly ridged on the back, about ¼ in. long.

A tree 18 to 20 feet in height with a trunk 6 or 8 in. in diameter, spreading branches forming a broad round-topped head and zigzag branchlets marked by large oblong pale lenticels, dark green and coated when they first appear with matted white hairs, becoming light orange-brown and very lustrous during their first season and ashy gray in their third year, and armed with stout straight or slightly curved lustrous chestnut-brown spines from 2 to 2½ in. long.

Flowers at the end of May. Fruit ripens after the first of October.

Rocky limestone ridges, *J. G. Jack*, Chateaugay and Caughnawaga, October, 1899, May and September, 1900.

In its 20 stamens *Crataegus Canadensis* resembles *C. mollis*, Scheele, of the Mississippi valley and the type of the group. It differs from it in the color of the branchlets, in the smaller flowers, in the much smaller late-ripening fruit, and in the shape, size and texture of the leaves. The other species of this group which have been found in the Province of Quebec and the Atlantic States have 10 never 20, stamens.

Crataegus Champlainensis, Sargent (Rhodora, iii. 20), *J. G. Jack*, Chateaugay, August, 1899, September, 1900, Adirondack Junction, October, 1899, May and September, 1900.

Crataegus submollis, Sargent (Bot. Gazette, xxxi. 7), Province of Quebec, *J. G. Jack*, Chateaugay, May and August, 1899, Rockfield, May, 1900, Caughnawaga, May and September, 1900, Montmorency Falls, September, 1900.

Crataegus anomala. Leaves ovate, acute, divided above the middle into 5 or 6 pairs of short acute or acuminate lobes, coarsely doubly serrate with spreading gland-tipped teeth except at the broadly cuneate or occasionally rounded base; as they unfold conspicuously plicate, scabrate above with short appressed white hairs, villose below particularly on the slender midribs and thin primary veins arching to the points of the lobes and only slightly impressed above, and at maturity membranaceous, yellow-green and glabrous on the upper surface, paler and villose below, 2½ to 3 in. long, 2 to 3 in. wide; petioles stout, slightly grooved and glandular on the upper side with scattered dark glands, ¾ to 1 in. long; stipules linear-lanceolate, or on vigorous shoots falcate and very oblique at the base, conspicuously glandular-serrate, often ½ in. in length. Flowers ½ in. in diameter on elongated slender pedicels, in broad loose compound 10–12-flowered thin-branched villose cymes; bracts and bractlets lanceolate to oblanceolate, finely glandular-serrate; calyx-tube narrowly obconic, densely villose with long matted pale hairs, the lobes lanceolate, acuminate, coarsely glandular-serrate, pubescent on the lower surface; stamens usually 10, occasionally 7 or 8; filaments slender; anthers large, rose-color or red; styles 4 or 5, surrounded at the base by a thin ring of pale tomentum. Fruit pendant in loose slightly villose clusters, obovate to oblong, gradually narrowed to the rounded base, crimson, lustrous, marked by large pale scattered lenticels, slightly villose toward the full and rounded apex, from ⅝ to ¾ in. long, ½ in. thick; calyx large and prominent, with a broad and shallow cavity, the lobes elongated, lanceolate, abruptly narrowed from broad bases, dark red on the upper side, tomentose, finely glandular-serrate, spreading and closely appressed, often deciduous before the ripening of the fruit; flesh light yellow, thin, rather juicy; nutlets 4 or 5, thin, prominently and irregularly ridged on the back, ¼ to $\frac{5}{16}$ in. in length.

A bushy intricately branched tree from 15 to 18 feet in height with a short trunk 6 in. in diameter and slender slightly zigzag branchlets marked by numerous oblong pale lenticels, dark green and villose when they first appear, bright red or orange-brown and lustrous during their second season, orange-brown during their third year, and armed with slender straight or slightly curved spines rarely more than 1¼ in. in length.

Flowers during the last week of May. Fruit ripens after the first of October.

Low limestone rocky ridges near the banks of the St. Lawrence River in the Caughnawaga Indian Reservation, opposite Lachine, *J. G. Jack*, May and September, 1900.

From all other species of the *Mollis* group *Crataegus anomala* may be distinguished by the rose-colored or red anthers, the other species having, so far as they have been observed, light yellow or nearly white anthers.

Flabellatae.

Crataegus flabellata, Spach, La Tortue, *J. G. Jack*, May and October, 1900, Caughnawaga, May and September, 1900.

First described from plants cultivated at the Jardin des Plantes in Paris and known only in the descendants of these plants in European gardens, *Crataegus flabellata* appears to have been first discovered in a wild state by Mr. Jack. A tall shrub, well distinguished by the long acute spreading lobes of the leaves, by the large flowers with 20 stamens and pink anthers, and by the small oblong late-ripening fruit.

Crataegus densiflora. Leaves oval to ovate, acute or short-pointed at the apex, broadly cuneate or occasionally rounded at the base, laciniately cut above the middle into numerous short narrow acuminate spreading lobes, crenulate-serrate, the small teeth tipped with bright red glands; covered in early spring on the upper surface with soft white caducous hairs, glabrous on the lower surface, and at maturity thin but firm in texture, dark dull green and smooth above, pale yellow-green below, 2 to 3 in. long, 1½ to 2 in. wide, with slender midribs only slightly impressed above and thin primary veins arching to the points of the lobes; petioles slender, glandular, more or less winged above on vigorous leading shoots, from 1 to 1½ in. long; stipules narrowly obovate to linear lanceolate, finely glandular-serrate, 1½ in. long, caducous. Flowers ½ in. in diameter, on slender elongated pedicels in very compact narrow thin-branched tomentose or villose many-flowered cymes; bracts and bractlets finely glandular-serrate, caducous; calyx-tube narrowly obconic, glabrous, the lobes lanceolate, glandular with bright red glands, glabrous on the outer surface, densely villose on the inner surface, reflexed after anthesis; stamens usually 10, sometimes 5 to 10; filaments slender; anthers small, pale red or pink; styles 3 or 4, surrounded at the base by a thick ring of hoary tomentum. Fruit in erect slightly villose few fruited clusters, oblong, dark crimson or purplish, covered with a pale bloom, marked by large scattered lenticels, about ⅝ in. long, nearly ½ in. wide; calyx cavity narrow,

not deep, the lobes elongated, villose above, closely appressed or occasionally erect and incurved; flesh yellow, thin, sweet, soft and pulpy; nutlets 3 or 4, thick, very prominently ridged on the back, about $\frac{3}{16}$ in. long.

A shrub often somewhat fastigiate in habit with slender erect stems 12 or 15 feet in height, and slender glabrous only slightly zigzag lustrous branchlets marked by oblong orange-colored ultimately gray lenticels, dark yellow-green when they first appear, light chestnut-brown and very lustrous during their first season, often becoming orange-brown during their second year and finally ashy gray, and armed with stout or slender straight or slightly curved bright chestnut-brown spines from 1 to $1\frac{1}{2}$ in. long.

Flowers from the 20th to the end of May. Fruit ripens from the first to the middle of September and often remains on the branches until early in October.

Rocky Limestone ridges, *J. G. Jack*, Rockfield, August 25, 1899, May and September, 1900, La Tortue, September and October, 1899, May and October, 1900, Caughnawaga, May and September, 1900.

Crataegus Holmesiana, Ashe (Sargent, Bot. Gazette, xxxi. 10), *J. G. Jack*, Chateaugay, August, 1894, Rockfield, July, 1899, May, 1900, Caughnawaga, September, 1899, May, 1900, Beauharvois, May, 1900. Also Lower Andoise, Cape Breton Island, *W. Faxon*, August, 1892, near Toronto, where it is probably common, *D. W. Beadle*, 1899.

Tenuifoliae.

Crataegus acutiloba, Sargent (Rhodora, iii. 23), Province of Quebec, *J. G. Jack*, Montmorency Falls, August 20, 1895, September, 1900, Adirondack Junction, May and August, 1899, Rockfield, September, 1900, Island of Orleans, September, 1900, Levis, September, 1900.

Crataegus pastorum, Sargent (Rhodora, iii. 24), *J. G. Jack*, Caughnawaga, August, 1899, Montreal, West, May and September, 1900, Adirondack Junction, September and October, 1900.

Crataegus scabrida, Sargent (Rhodora, iii. 29), *J. G. Jack*, Caughnawaga, August, 1899, Rockfield, May and September, 1900, Adirondack Junction, September, 1900.

Dilitatae.

Crataegus dilitata Sargent (Bot. Gazette, xxxi. 9), *J. G. Jack*, Caughnawaga, May and September, 1900.

TOMENTOSAE.

Crataegus Laurentiana. Leaves oblong to oblong-obovate, acute or acuminate at the apex, gradually or abruptly narrowed from near the middle to the base, divided above, occasionally often deeply on vigorous leading shoots, into four or five pairs of narrow acute lobes, sharply and often doubly glandular-serrate except toward the base; in early spring yellow-green and roughened above by short appressed pale hairs and villose along the veins below with scattered white hairs, and at maturity subcoriaceous, dark green and glabrous on the upper surface and paler on the lower surface, with stout midribs and slender remote primary veins running to the points of the lobes and rarely slightly hairy below, 2 to 2½ in. long, 1 to 2 in. wide; petioles stout, more or less broadly winged above, deeply grooved, glandular with small dark mostly deciduous glands, villose in spring, ultimately glabrous, often dark red after midsummer like the lower side of the mibribs of the leaves of leading shoots, ½ to 1 in. long; stipules lanceolate to oblanceolate, finally glandular-serrate, bright red in fading, ⅓ to ½ in. long. Flowers ⅝ in. in diameter on elongated slender pedicels in broad loose many-flowered thin-branched compound huey corymbs; bracts and bractlets linear, finally glandular-serrate, bright red before falling, caducous; calyx-tube broadly obconic, coated at the base with long matted pale hairs, nearly glabrous or puberulous above, the lobes narrow, acuminate, conspicuously glandular-serrate, nearly glabrous on the outer surface, villose on the inner surface, reflexed after anthesis: stamens 10; filaments slender; anthers small, pale pink, fading purple; styles 3-5. Fruit in wide thick-branched slightly villose drooping or erect clusters, oblong, dark crimson, from ⅓ to ½ in. long; calyx prominent with a deep broad cavity and elongated glandular-serrate appressed lobes; flesh thin, yellow, finally becoming sweet and succulent; nutlets 4 or 5, thick and broad, about ¼ in. long, prominently ridged on the back with broad rounded ridges, grooved on the inner faces by two shallow irregularly shaped lateral depressions.

A stout much-branched shrub with thick stems 10 to 15 feet high, and stout zigzag branchlets, dark green and coated when they first appear with hoary tomentum, soon becoming glabrous, bright orange-brown and very lustrous during their first season and gray during their second year, and armed with very stout chestnut-brown lustrous spines from 2 to 3 in. long and often pointed toward the base of the branch.

Flowers the first week of June. Fruit ripens at the end of September and shrivels on the branches sometime before falling.

J. G. Jack, Rocky Banks of the St. Lawrence River in the village of La Tortue at the Lachine Rapids, August and October, 1899, May, 1900, and rocky limestone ridges, Caughnawaga, October, 1899, May, 1900.

Crataegus macracantha, Lindley, *J. G. Jack*, Adirondack Junction, October, 1899, La Tortue, September, 1899, Rockfield, Chateaugay, Isle of Orleans, May and September, 1900, Caughnawaga, May, 1900.

Crataegus succulenta, Link, *J. G. Jack*, Montreal West, September, 1899, Adirondack Junction, October, 1899, May, 1900, Caughnawaga, 1899, Rockfield, September, 1900; also near Toronto, *D. W. Beadle*, 1899.

Crataegus integriloba. Leaves broadly obovate to oval, cuneate, decurrent and entire at the base, irregularly laciniate above the middle with short acute lobes, coarsely doubly serrate with spreading glandular teeth; in early spring coated with soft pale caducous hairs and at maturity glabrous, thin but firm in texture, dark green and lustrous on the upper surface, pale yellow-green on the lower surface, 1½ to 3 in. long, 1¼ to 2 in. wide, with slender midribs and numerous straight primary veins deeply impressed above; petioles stout, grooved, more or less broadly winged above, often bright red on the lower side like the base of the midribs; stipules linear, finely glandular-serrate, villose, light red, ¾ to 1 in. long, caducous. Flowers ¾ in. in diameter, in compound thin-branched many-flowered villose cymes; bracts and bractlets linear, glandular-serrate, caducous; calyx-tube broadly obconic, coated towards the base with long matted white hairs, glabrous above, the lobes linear-lanceolate, elongated, entire or very rarely furnished with an occasional caducous gland; stamens 10; filaments rather short; anthers large, rose-color; styles 2 or 3, surrounded at the base by a narrow ring of soft white hairs. Fruit in erect or drooping broad loose slightly villose clusters, subglobose, bright scarlet, lustrous, marked by occasional large pale lenticles from ⅓ to ½ in. in diameter; calyx prominent with a comparatively broad deep cavity, the lobes elongated, entire, dark red on the upper side at the base, strongly reflexed, presistent; flesh thin, yellow, soft, sweet and pulpy; nutlets 2 or 3, about ¼ in. long, thick and broad, prominently often doubly ridged on the back, penetrated on the inner faces by two broad deep lateral grooves.

A tree from 12 to 18 feet in height with a straight erect stem 6 or 8 inches in diameter, wide-spreading or erect branches forming an open irregular head and stout only slightly zigzag glabrous branchlets marked by occasional small pale lenticels, very lustrous and red-brown or orange-brown during their first season, later becoming dull ashy gray, and armed with stout usually straight spines varying from 1½ to 2½ in. in length.

Flowers during the first week in June. Fruit ripens at the end of September or early in October.

Low limestone rocky ridges, *J. G. Jack*, Beauharnois, August 24, 1899, Caughnawaga, August 29, 1899, May and October, 1900,

Rockfield, September, 1900, Adirondack Junction, September, 1900.

Well distinguished by its entire calyx-lobes from all the known forms of the small group of species distinguished by the longitudinal grooves on the inner faces of the nutlets, of which *Crataegus tomentosa*, L., is the type.

Coccineae.

Crataegus coccinea, Linnaeus (Sargent, Bot. Gazette, xxxi, 13), *J. G. Jack*, Caughnawaga, 1899, May, 1900, *J. M. Macoun*, Levis, September, 1900, *A. C. Waghorn*, Newfoundland, where it is probably the only species. Common on the coast of Maine and to be looked for in the coast region of the Maritime Provinces and in the valley of the lower St. Lawrence River.

Crataegus coccinea var. rotundifolia, Sargent (Bot. Gazette, xxi, 14), *J. G. Jack*, near Montreal, August 19, 1887, Isle of Orleans, August, 1895, September, 1900, Caughnawaga, October, 1899, May, 1900, Adirondack Junction, October, 1899, Chateaugay, October, 1899, May, 1900; *J. M. Macoun*, Levis, September, 1894.

Crataegus praecox Sargent (Rhodora, iii, 27), *J. G. Jack*. Chateaugay and Caughnawaga, May and August 1899. May, 1900.

Arnold Arboretum.

TWO NEW SMUTS ON ERIOCAULON SEPTANGULARE.

(Contribution from the Cryptogamic Laboratory of Harvard University, No. 46.)

G. P. Clinton.

In November of last year the writer finding some specimens of *Eriocaulon septangulare* With. at Ellis, Massachusetts, took a few of the plants home for herbarium specimens. Examination of the flower-heads a few days later disclosed the fact that the ovaries were infected with a new species of smut belonging to the genus Tolyposporium. A visit again to Ellis showed that all of the plants then to be found, several hundred, were infected, so it was merely a question of collecting all of the heads to get the smut in quantity.

The fungus is so inconspicuous that one is not likely to discover it

unless examining the heads with a magnifier. The flowers of this plant are androgynous and it is apparently only in the pistillate ones that the smut is found. The removal of the calyx and corolla of such discloses a greyish oval body one to two millimeters in length. This is the infected ovary and it generally shows distinctly the two lobes. It is completely filled with the spore-balls which are apt to give it a faintly nodulose appearance. The ovary-wall is easily ruptured, the spore-balls falling out and resembling very minute seeds. They are black, perfectly opaque under the microscope, and vary from imperfectly oblong to sub-spherical, generally with sides somewhat angled through pressure. They range from 65–275 μ in diameter.

The spore-balls are made up of a large number of light-colored spores. These have a slight violet tint and are enveloped by a very thin outer coat provided with evident dark winged reticulations or wrinkles which firmly glue the spores together into the balls and give these their dark color. Upon the rupture of the spore-balls through pressure, these coverings are more or less broken showing on the spores as reticulations or spine-like processes or even becoming entirely detached. The spores (fig. 1) are subspherical, 8–11 μ in diameter (exclusive of the processes) and resemble closely those of *Tolyposporium bullatum* on *Panicum Crus-galli* but are not angular. The character of the infected ovaries of the latter species is also quite distinct, though this is a character that is perhaps more dependent on the host than on the fungus.

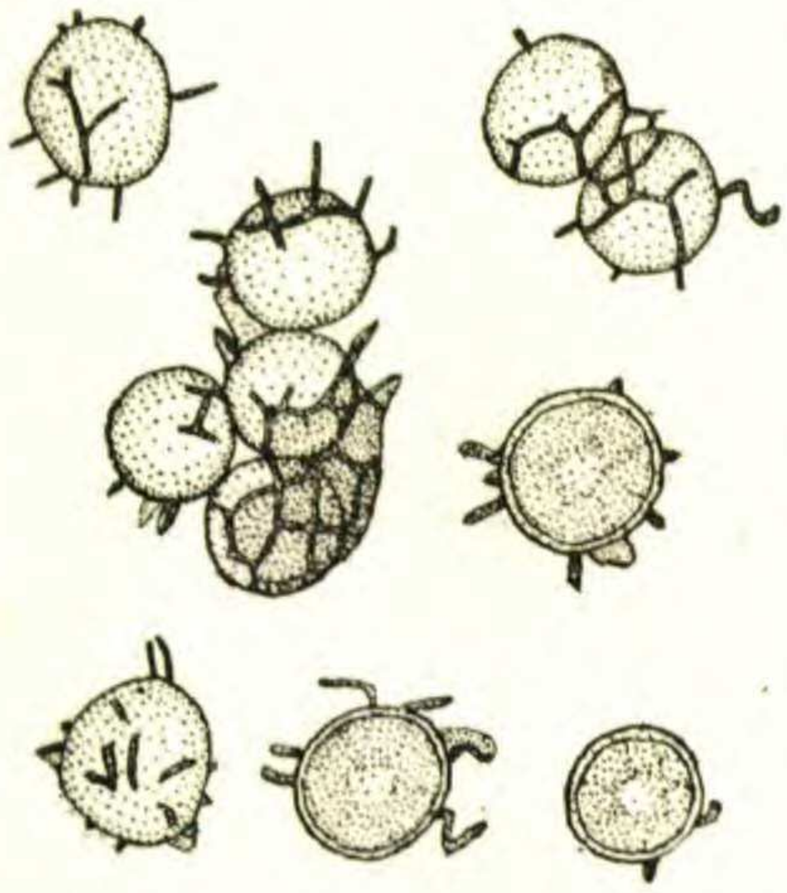

Fig. 1.

Attempts to germinate this smut were successful only in the cultures kept in the incubator, this being about 36° C. Germination, when successful, generally began by end of second day. In water a septate pro-mycelium several times the length of the spore and about 2.5 μ wide was developed which generally became empty of protoplasm at the apex or at the base and frequently developed a prominent lateral branch. Very often the germ-threads broke up into joints or became separated from the spore by the gelatinization of the empty base. The threads were finally emptied of protoplasmic contents by

the production of lateral sporidia, a few at a time, which readily fell off in the water and did not while attached or afterward reproduce themselves to any extent by budding. The sporidia were quite variable, oblong with ends somewhat acute, and chiefly 6–12 by 1–2.5 μ. In solid nutrient media the germination of the spore-balls, when successful, was much more luxuriant, so that multitudes of more vigorous and connected sporidia were formed on the promycelia and were eventually extended further out into the medium by radiating threads, which at intervals gave rise to them, sometimes there being developed a series of distinct groups of connected sporidia though more likely through luxuriant budding these were all fused together as a common mass surrounding the spore-ball. Cultures of the sporidia act in much the same way.

In a search at South Billerica later in the month for plants of *Eriocaulon septangulare* that contained seeds which could be used for infection experiments with the Tolyposporium, it was found that all of the plants then at this locality were infected with a smut that was different from that collected at Ellis. Upon examination this proved to be a new species of Ustilago. The infected heads were smaller than those containing the Tolyposporium, but like that fungus the smut was found only in the ovaries of the pistillate flowers. In this case, however, there were occasionally found ovaries that had matured their seeds. The infected ovaries are somewhat smaller than those infected by the other smut, are oval in shape and generally broader than long, being about 0.75 by 1 millimeter. They are more decidedly two lobed and being quite dark colored are more apt to be seen by the naked eye. Neither are they so easily ruptured and when broken open disclose a tightly packed mass of dark olive spores. In one case a head was found that contained both smuts. The two, however, are readily distinguished with the aid of a hand lens when their characteristics have been learned. The spores of the Ustilago (fig. 2) are quite different from those of the Tolyposporium, being irregularly polygonal to sub-spherical

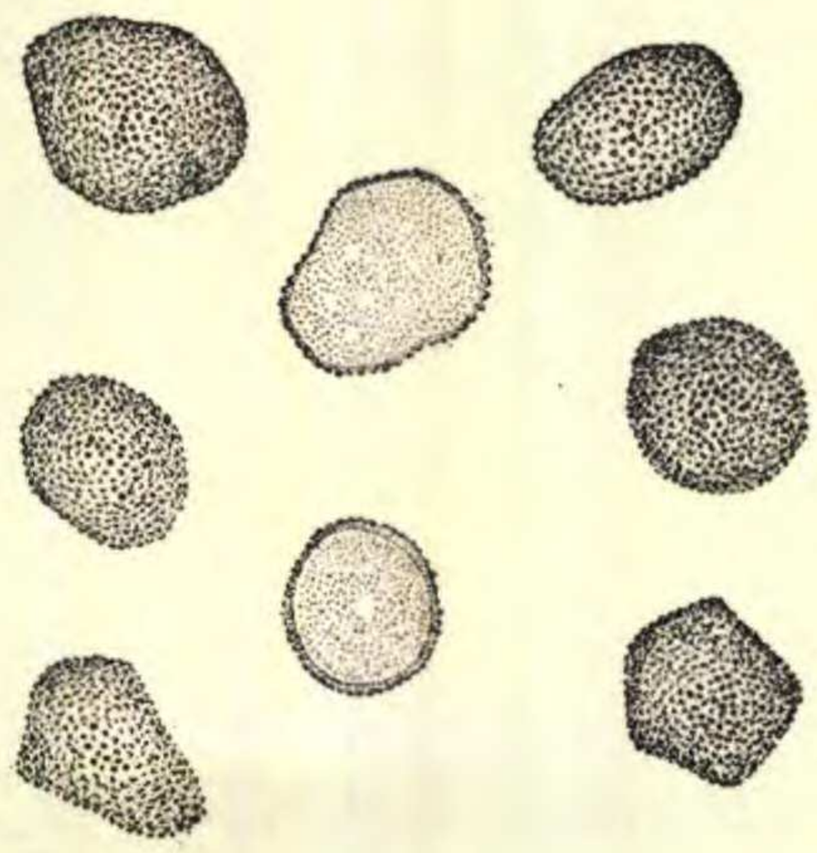

Fig. 2

or occasionally more elongated, much darker, prominently verruculose and 9–15 μ in diameter.

This Ustilago was only germinated in water in the incubator and was found to produce usually a four celled pro-mycelium about 3 μ wide and four or five times as long as diameter of spores. This produced terminal and lateral sporidia, which fell off before others were produced. Sometimes the germ-threads became more elongated, septate and empty at base and had a tendency to restrict the protoplasm to several places in the thread from which the sporidia were sprouted off, sometimes two or even three standing side by side. Such threads are apt to become detached from the spores and break up somewhat into joints. The sporidia vary considerably, generally being oblong in shape and in size about 6–12 by 1.5–3 μ.

The writer is indebted to Professor Thaxter for aid in the study of these smuts and expects to treat more fully of their life history in a paper on some American Ustilagineae that is in preparation. The drawings of the spores of the two smuts as given here are magnified about 900 diameters. The specific characters may be given as follows:

Tolyposporium Eriocauli, n. s. Sori greyish, oval, somewhat two-lobed, 1–2 mm. in length, easily ruptured; spore-balls firm, black, perfectly opaque, irregularly oblong to subspherical, frequently somewhat angled, 65–275 μ in diameter; spores sub-spherical to spherical, light-colored, adhering together by dark winged folds which on rupture of balls show as reticulations or spine-like processes or become entirely detached, 8–11 μ in diameter exclusive of processes.

Inconspicuous in ovaries of pistillate flowers of *Eriocaulon septangulare* With., Ellis, Massachusetts.

Ustilago Eriocauli, n. s. Sori black, oval, very distinctly two lobed, usually about 0.75 mm. long by 1 mm. wide, firm, not easily ruptured; spores tightly packed together in a dark olive mass, irregularly polygonal to sub-spherical though occasionally more elongated, prominently verruculose, 9–15 μ in diameter.

Inconspicuous in ovaries of pistillate flowers of *Eriocaulon septangulare* With., South Billerica, Massachusetts.

Cambridge, Massachusetts.